LESSON THIRTEEN

What is light?

SCIENCE

Asking Questions, Developing Models, and Constructing Explanations

ENGLISH LANGUAGE ARTS

Reading Informational Text, Writing an Explanation

GRADE 8

90-120 minutes

PURPOSE

In this lesson, students extend their knowledge about chemical reactions in fireflies by learning about light. Students use multiple texts to gather information about the properties of light and continue to practice synthesizing information from multiple sources. At the end of the lesson, students are expected to write an explanation of these properties while they also demonstrate their ability to synthesize information across multiple sources.

STANDARDS

Common Core State Standards

- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. CCSS.ELA-LITERACY.WHST.6-8.2.B
- Use precise language and domain-specific vocabulary to inform about or explain the topic. CCSS.ELA-LITERACY.WHST.6-8.2.D
- Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CCSS.ELA-LITERACY.WHST.6-8.8
- Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. CCSS.ELA-LITERACY.SL.8.1.A

STANDARDS CONTINUED

- **Next Generation Science Standards**
  - Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. MS-PS-1-4
  - Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. MS-PS-1-5
  - Chemical Reactions. PS1.B

    Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of reactants.

    The total number of each type of atom is conserved, and thus the mass does not change.
  - Wave Properties. PS4.A

    A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.

- **Science and Engineering Practices**
  - Asking questions and defining problems
  - Developing and using models
  - Constructing explanations and designing solutions

LEARNING GOALS

- Understand the properties of light.

SUCCESS CRITERIA

1. Describe the properties of light: light is a form of energy with no mass, light can act as a particle, and visible light is part of the electromagnetic spectrum.
2. Construct an accurate explanation of light, including a description of its existence along the electromagnetic spectrum.
3. Reference appropriate and relevant evidence from multiple texts to support explanation.

SUMMARY OF LESSON TASKS

1. Complete a Double Entry Journal and discuss.
2. Watch video and discuss: What is Light? (2:19).
3. Discuss initial thinking and report.
4. Read two texts: The Universe of Light: What Do You Know About Light? and Star Light, Star Bright.
5. Complete Double Entry Journal and discuss.
6. Watch video(s): What is Light? (4:38) and Nature of Light (3:51).
7. Write an explanation.

CULMINATING TASK

Write a one to two-paragraph explanation in response to the question, "What is light?" Include information that details the properties of light, including explanation of light as a form of energy with no mass, can act as a particle, travels in waves, and its relationship to the electromagnetic spectrum. Support your explanation with evidence from texts, discussions, and other relevant sources. Cite your sources.

PART I: INTRODUCTION

INTRODUCE THE TOPIC Explain that today students will extend their knowledge of chemical reactions and continue to explore the concept of light. Ask students to think about the question, "What is light?"

COMPLETE DOUBLE ENTRY JOURNAL AND DISCUSS Provide students with time to think about the question and review texts or notes from previous lessons. Students complete a Double Entry Journal in their Science Notebooks. In the first column, students should record and paraphrase notes related to the initial question. In the second column, students include supporting details and source information. Once students complete their Double Entry Journals, discuss and chart responses as a whole class.

WATCH VIDEO Introduce the video What is Light? (2:19) (https://youtu.be/CG4ZXpzuzt4?list=PL211B8814A052BDED). Explain that this brief video about light will provide additional information that students can use to add to their Double Entry Journals. Show the video twice, encouraging students to take notes in their Science Notebooks during the second viewing

SUCCESS CRITERION EVIDENCE-GATHERING OPPORTUNITY

- Construct an accurate explanation of light.
- Reference appropriate and relevant evidence from multiple texts.

As students watch the video, check that they are recording additional key ideas discussed in the video, including: light is visible as it travels only when it hits an object that reflects it, light is pure energy, and light has no mass.

PART II: GUIDED PRACTICE

READ Provide students with access to two online texts: The Universe of Light: What Do You Know About Light? (http://cse.ssl.berkeley.edu/light/measure.html) and Star Light, Star Bright (http://amazingspace.org/resources/explorations/light/). These texts provide students with information about the properties of light. Preview the texts prior to assigning the reading. Students will be required to read and navigate the text in specific ways and it might pose unnecessary confusion.

For the first text, The Universe of Light: What Do You Know About Light?, students read the first three sections: "How Does Light Behave?" "How Do You Measure a Light Wavelength?" and "What is the Amplitude of a Wave?" For the second text, Star Light, Star Bright, students navigate through all of the Catch the Waves (http://amazingspace.org/resources/explorations/light/CatchWaves_activation-frames.html) sections of the online text. In addition, students should also read the "Light Facts" section (top right-hand corner). When students reach the end of Catch the Waves, they should also read the "What Do You Know" section. Note that both are older online texts that students navigate to learn about properties of light, wavelength, frequency, and amplitude. Students require access to laptops or tablets to read and navigate these online texts. In the event that students do not have online access to materials, provide printed copies of the texts.

COMPLETE A DOUBLE ENTRY JOURNAL AND DISCUSS Students complete a Double Entry Journal to take notes about main ideas and supporting details as they read and navigate the online texts.

SUCCESS CRITERION
EVIDENCE-GATHERING OPPORTUNITY

- Reference appropriate and relevant evidence from multiple texts.

While students read and complete Double Entry Journals, check that students accurately record main ideas and supporting details about the properties of light. These texts are the main source of information students will draw information from when they construct their explanations at the end of the lesson.

ANTICIPATED RESPONSE
PEDAGOGICAL ACTION

If you notice students select inaccurate main ideas or supporting details on their own, ask students to work with a partner to compare Double Entry Journals. When students work together, they should be able to explain why they chose a main idea or supporting detail to one another. Discussions like these support students in revisiting the ideas of the text and practice with providing justification for their choices.

WATCH VIDEO(S) The two videos, What is Light? (4:38) (https://youtu.be/IXxZRZxafEQ) and Nature of Light (3:51) (https://youtu.be/XB-iLRsq8A8), provide students with additional information about the properties of light. Select one, or both, of these videos to watch with students to give multiple opportunities to learn about light. Show the video(s) more than once, encouraging students to take notes in their Science Notebooks during the second viewing. After viewing the video(s), remind students to return to their Double Entry Journals to make revisions.

PART III: CULMINATING TASK

WRITE EXPLANATION All success criteria are addressed in this final task. Students construct a one to two-paragraph explanation in response to the question, "What is light?" Students explain the properties of light, including a description of light as a form of energy with no mass, can act as a particle, travels in waves, and its relationship to the electromagnetic spectrum. Students support their explanation with evidence from multiple texts, discussions, and other relevant sources. Additional criteria include:

- accurate description of the properties of light (energy, no mass, acts as a particle, travels in wavelength, exists along a continuum – the electromagnetic spectrum)
- appropriate use of key content vocabulary
- references relevant and appropriate evidence to support explanation

FINAL LESSON SELF-REFLECTION AND DISCUSSION Provide students with time to review the initial conjectures they recorded in their Science Notebooks answering the question, "What is light?" To support students, provide a sentence frame like the following:

- At first I thought that light was _____. After reading and discussing different sources of information, I now know that light is _____.

Ask students to complete the sentence frame. Discuss reflections as a whole class and return to the class chart created at the beginning of the lesson. Revise the chart together.

ADDITIONAL LESSON RESOURCES

Background

- Teacher Lesson Support - http://sciencenetlinks.com/lessons/light-1-making-light-of-science/

DOUBLE ENTRY JOURNAL

What is light?	How do you know? What is your evidence? Cite your sources.

DOUBLE ENTRY JOURNAL

Main ideas	Supporting details